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Further observations on bone overgrowth and nerve degeneration produced by defective diet. By EDWARD MELLANBY

Widespread nerve degeneration produced in young animals by diets deficient in vitamin A (and carotene) and rich in cereals has been previously described [Mellanby, 1931, 1934, 1935]. In a detailed examination of the degenerative changes in the 8th nerve of dogs, it appeared that these were due to overgrowth of bone of the labyrinthine capsule [Mellanby, 1938*a*, *b*]. Macroscopic changes of the bone in the skull also suggested that bone overgrowth in other regions might well account for the degenerative changes in the trigeminal and optic nerves [Mellanby, 1938*b*].

Trigeminal nerve

After removal of the petrous ridge in these animals the abnormal curvature of the central branch of the 5th nerve can often be seen by naked eye. Serial sections show that overgrowth of this ridge and to some extent of the bone supporting the Gasserian ganglion compresses both the ganglion and the nerve centrally to the ganglion. In advanced cases the ganglion becomes elongated and the central roots of the nerve near the ganglion bent. In one case enlargement of a small portion of bone partially plugged the foramen of the 5th nerve.

Optic nerve

Transverse serial sections of the optic nerve and surrounding bone showed partial closure of the foramen and compression of the nerve.

Pituitary body

The head of the posterior clinoid process grows anteriorly and slightly downwards and there is also overgrowth of the anterior clinoid process, so that the pituitary body may be thus compressed between them and its antero-posterior length decreased. Elongation and degeneration of the cells in certain parts of the pars anterior are sometimes seen.

When it was realized that bone overgrowth was so widespread, a general study of the skull was made and the frontal, parietal and occipital bones were found to be affected. In fact, the overgrowth round the foramen magnum may be so great as almost to obliterate the cisterna

magna. This may also account for the increased pressure of cerebrospinal fluid, which is sometimes nearly twice as high as that of animals receiving vitamin A. With the increased intracranial pressure, the choroid plexus may be bunched up and its structure altered greatly.

Vertebral column and spinal nerves

Definite bone and other abnormalities were also revealed by serial sections through the vertebral column and spinal cord. The spinal canal is smaller in diameter and the space surrounding the spinal cord, containing loose fatty tissue and the cerebrospinal fluid, is reduced. This may cause some increase in pressure on the cord and nerve roots. A more definite pressure effect can sometimes be seen in the case of the posterior root ganglion: this structure is compressed between the intervertebral disc and the lateral portion of the vertebra.

Other bones are also altered by these diets but the changes vary in degree: bones showing these changes including the femur, the radius, the ulna and the ribs. The bone overgrowth consists generally of an increase in bulk rather than of an increase of calcified tissue, the increase in size often being due to the bone becoming less compact and more cancellous. In some cases, however, there is a definite increase in calcified tissue as in the labyrinth.

Most of these observations have been made on young dogs. Evidence has been obtained, however, that the same diets may affect the bones of adult dogs, but the changes in such cases take much longer to produce. Rabbits and rats react similarly.

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